



## NOAA SCIENTIFIC PUBLICATIONS REPORT MAY 12, 2014

### **HIGHLIGHTED ARTICLES**

[\*Limacina helicina\* shell dissolution as an indicator of declining habitat suitability due to ocean acidification in the California Current Ecosystem](#)

[Cryptic changes in the genetic structure of a highly clonal coral population and the relationship with ecological performance](#)

[Multi-decadal trends in the nesting phenology of Pacific and Atlantic leatherback turtles are associated with nesting population demography](#)

[Long-term citizen-collected data reveal geographical patterns and temporal trends in lake water clarity](#)

### **ADDITIONAL ARTICLES**

[Maternal thyroid and glucocorticoid hormone interactions in larval fish development, and their applications in aquaculture](#)

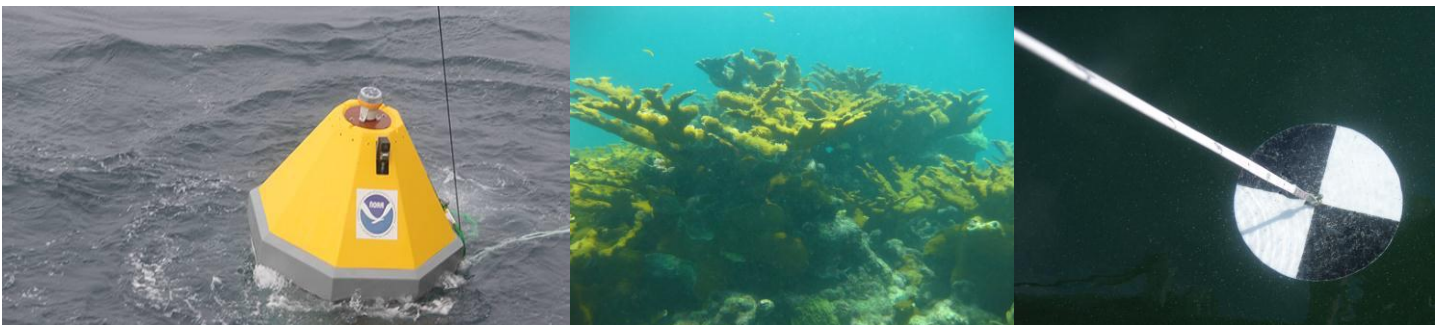
[Nomads no more: early juvenile coho migrants contribute to the adult return](#)

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[How does the Amur River discharge flow over the northwestern continental shelf in the Sea of Okhotsk?](#)

[Investigating spatial variation and temperature effects on maturity of female winter flounder \(\*Pseudopleuronectes americanus\*\) using generalized additive models](#)





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[Connecting international priorities with human wellbeing in low-income regions: lessons from hawksbill turtle conservation in El Salvador](#)

[A new look at methane and non-methane hydrocarbon emissions from oil and natural gas operations in the Colorado Denver-Julesburg Basin](#)

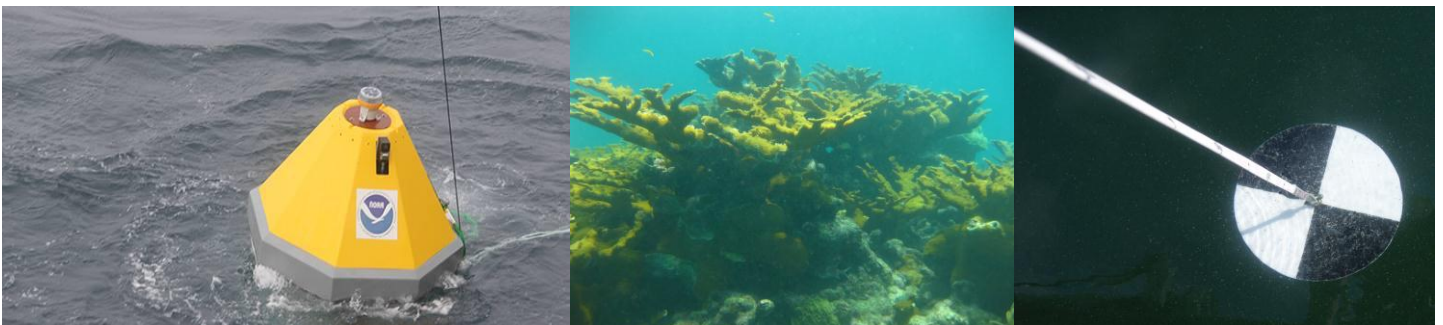
[Sensitivity of sediment paleolimnological proxy records to coring locations and corer types in a large lake](#)

[Time course of oocyte development in winter flounder \(Pleuronectidae: \*Pseudopleuronectes americanus\*\) and spawning seasonality for the Gulf of Maine, Georges Bank, and Southern New England stocks](#)

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[Effects of chemical contaminants on growth, age-structure, and reproduction of \*Mytilus edulis\* complex from Puget Sound, Washington](#)

[The contribution of estuary-resident life histories to the return of adult coho salmon \*Oncorhynchus kisutch\* in Salmon River \(Oregon\)](#)





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### HIGHLIGHTED ARTICLES

*Limacina helicina* shell dissolution as an indicator of declining habitat suitability due to ocean acidification in the California Current Ecosystem

Royal Society Proceedings Biology

**N. Bednarsek (OAR/PMEL), R.A. Feely (OAR/PMEL), J.C.P. Reum (NMFS/NWFSC), B. Peterson (NMFS/NWFSC), J. Menkel, S.R. Alin (OAR/PMEL),** and B. Hales

- This is the first evidence found of severe damage of “free-swimming” marine snails called pteropods from ocean acidification found on the continental shelf of western North America.
- These findings also represent the first evidence that an important coastal prey species for pink salmon, mackerel and herring is seasonally impacted by ocean acidification.
- This means that ocean acidification may be seriously impacting the marine ecosystem on our continental shelf right now.

Few studies to date have demonstrated widespread biological impacts of ocean acidification (OA) under conditions currently found in the natural environment. From a combined survey of physical and chemical water properties and biological sampling along the Washington-Oregon-California coast in August 2011 we show that large portions of the shelf waters are corrosive to pteropods in the natural environment. We show a strong positive correlation between the proportion of pteropod individuals with severe shell dissolution damage and the percentage of undersaturated water in the top 100 m with respect to aragonite. We found 53% of onshore individuals and 24% of offshore individuals on average had severe dissolution damage. Relative to pre-industrial CO<sub>2</sub> concentrations, the extent of undersaturated waters in the top 100 m of the water column has increased over six-fold along the California Current Ecosystem (CCE). We estimate that the incidence of severe pteropod shell dissolution due to anthropogenic OA has doubled in nearshore habitats since pre-industrial conditions across this region and is on track to triple by 2050. These results demonstrate that habitat suitability for pteropods in the coastal





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CCE is declining. The observed impacts represent a baseline for future observations toward understanding broader-scale OA effects.

Published: 30 April 2014

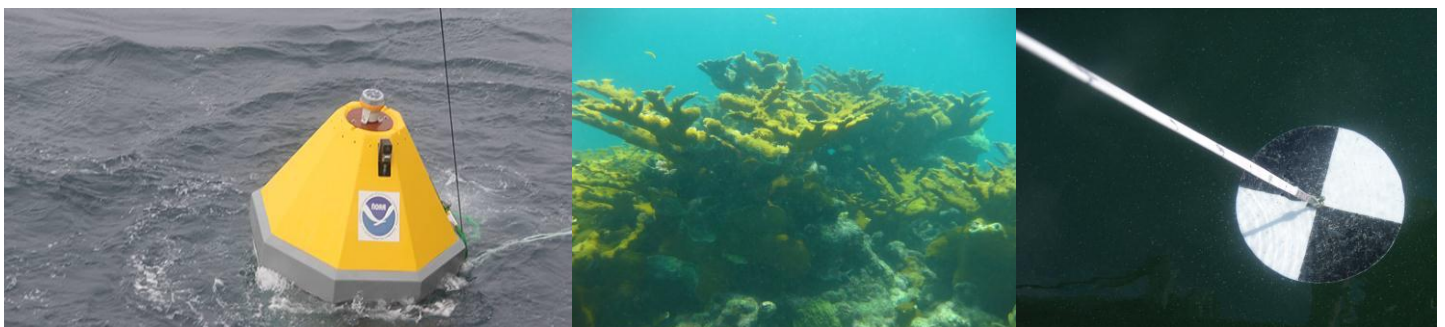
### *Cryptic changes in the genetic structure of a highly clonal coral population and the relationship with ecological performance*

#### Coral Reefs

**D.E. Williams, M.W. Miller (NMFS/SEFSC), and I.B. Baums**

- ESA listed elkhorn coral populations in the Florida Keys are even more depauperate than studies had previously indicated.
- Significant loss of genetic individuals has occurred in this population during a 4-year period, and may be approaching a condition of ‘sexual extinction’ (i.e. unable to produce larvae due to low spawning density).
- This phenomenon suggests that an important restoration/recovery action may involve genotypic supplementation by transplanting individuals in close enough proximity to enhance fertilization potential.

Elkhorn coral, *Acropora palmata*, relies heavily on clonal propagation and often displays low genetic diversity. Populations in the Florida Keys experienced rapid declines in tissue cover between 2004 and 2006, largely due to hurricanes and disease, but remained stable from 2006 to 2010. All elkhorn colonies in 150 m<sup>2</sup> permanent study plots were genotyped in 2006 (n = 15 plots) and 2010 (n = 24 plots) to examine changes in genetic diversity during this period of stable ecological abundance. In 2010, Florida Keys plots (~19 colonies) contained an average of  $2.2 \pm 1.38$  (mean  $\pm$  SD) genets with a significant negative relationship between colony abundance and genotypic diversity. Overall, genetic diversity of Florida Keys plots was low and declined further over the four year period; seven of the 36 original genets and two of 67 alleles (among five microsatellite loci) were lost completely from the sampled population and an additional 15 alleles were lost from individual reefs. When scaled to total tissue cover,







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genotypic diversity is even lower, with 43% of genets below the size of sexual maturity. The authors examined the hypothesized positive relationship of local genotypic diversity with ecological performance measures. In Florida study plots ( $n = 15$ ), genotypic diversity was not significantly correlated with tissue loss associated with chronic predation, nor with acute disease and storm fragmentation events, though this relationship may be obscured by the low range of observed diversity and potential confounding with abundance. When more diverse plots in Curaçao ( $n = 9$ ) were examined, genotypic diversity was not significantly correlated with resistance during an acute storm disturbance nor rate of recovery following disturbance. Cryptic loss of genetic diversity occurred in the apparently stable Florida Keys population and confirms that stable or even increasing abundance does not necessarily indicate genetic stability. Accepted: 10 April 2014

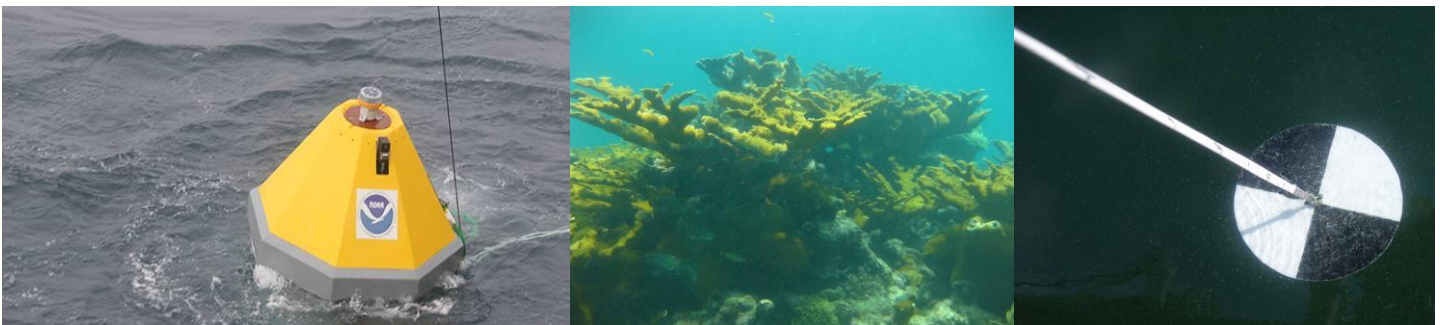
*Multi-decadal trends in the nesting phenology of Pacific and Atlantic leatherback turtles are associated with nesting population demography*

Endangered Species Research

N.J. Robinson, S.E. Valentine, P.S. Tomillo, **V.S. Saba** (NMFS/NEFSC), J.R. Spotila, and F.V. Paladino

- Authors investigated the factors influencing multi-decadal trends in the nesting phenology of Pacific and Atlantic leatherback turtles.
- In comparison to recent decades, Atlantic leatherback turtles are nesting earlier, and Eastern Pacific turtles are nesting later. These differences appear to correlate with demography and population size, but effects of oceanographic conditions on pre-nesting animals may also be a factor.
- As climate changes, the ability of these turtles to shift nesting to times or places with more favorable conditions may be a critical factor in sustaining populations.

Determining the mechanisms that influence an organism's reproductive phenology can provide insights into the capacity of certain species to adapt to climate change. Here authors





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investigated the factors influencing multi-decadal trends in the nesting phenology of the critically endangered leatherback turtle (*Dermochelys coriacea*) at Playa Grande, Costa Rica in the eastern Pacific Ocean and at Sandy Point, U.S. Virgin Islands in the western Atlantic Ocean. The oceanographic conditions experienced by pre-nesting turtles did not appear to influence the median nesting date (MND) at either site. However, the MND at Playa Grande was correlated with population size ( $r^2 = 0.46$ ,  $p < 0.01$ ). While authors do not rule out that environmental conditions may affect the MND in some manner, they conclude that demographic processes linked to population size may be driving the overall trends observed in the MND over the study period. Whereas the MND at Playa Grande has occurred later at a rate of  $\sim 0.3 \text{ d yr}^{-1}$ , the MND at Sandy Point has occurred earlier at a rate of  $\sim 0.17 \text{ d yr}^{-1}$ . Eastern Pacific leatherback turtles may even be at particular risk considering that current shifts in the MND towards hotter and drier conditions at the end of the nesting season could exacerbate the effects of climate change. Expected Publication Date: Summer 2014

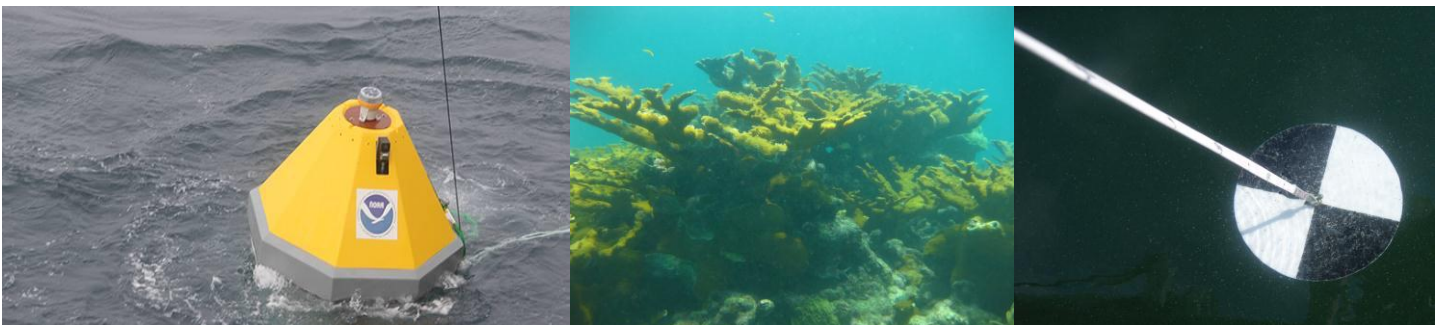
*Long-term citizen-collected data reveal geographical patterns and temporal trends in lake water clarity*

PLOS

N.R. Lottig, T. Wagner, E.N. Henry, K.S. Cheruvilil, K.E. Webster, J. A. Downing, and C.A. Stow (OAR/GLERL)

- This work makes important advances in monitoring and interpreting changes in coastal ecosystem health.
- The study demonstrates that collaborations among citizens, research scientists, and government agencies may be important for developing the data sources and analytical tools necessary to advance an understanding of the factors influencing macro-scale patterns such as those shown here for lake water clarity.

The authors compiled a lake-water clarity database using publically available, citizen volunteer observations made between 1938 and 2012 across eight states in the Upper Midwest, USA. The



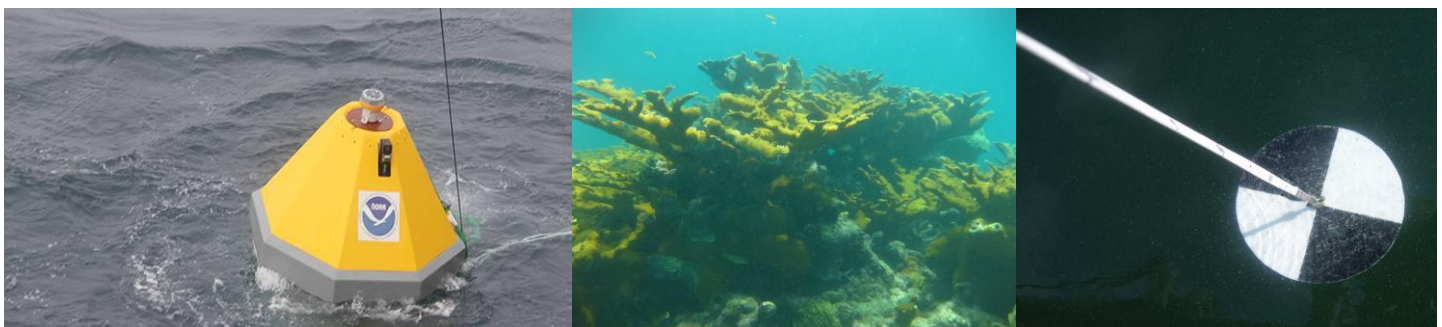


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study's objectives were to determine (1) whether temporal trends in lake-water clarity existed across this large geographic area and (2) whether trends were related to the lake-specific characteristics of latitude, lake size, or time period the lake was monitored. The database consisted of 140,000 individual Secchi observations from 3,251 lakes that were summarized per lake-year, resulting in 21,020 summer averages. Using Bayesian hierarchical modeling, the authors found approximately a 1% per year increase in water clarity (quantified as Secchi depth) for the entire population of lakes. On an individual lake basis, 7% of lakes showed increased water clarity and 4% showed decreased clarity. Trend direction and strength were related to latitude and median sample date. Lakes in the southern part of the study-region had lower average annual summer water clarity, more negative long-term trends, and greater interannual variability in water clarity compared to northern lakes. Increasing trends were strongest for lakes with median sample dates earlier in the period of record (1938–2012). The authors' ability to identify specific mechanisms for these trends is currently hampered by the lack of a large, multi-thematic database of variables that drive water clarity (e.g., climate, land use/cover). These results demonstrate, however, that citizen science can provide the critical monitoring data needed to address environmental questions at large spatial and long temporal scales. Collaborations among citizens, research scientists, and government agencies may be important for developing the data sources and analytical tools necessary to move toward an understanding of the factors influencing macro-scale patterns such as those shown here for lake water clarity.

Published: 30 April 2014

<http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0095769>







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### ADDITIONAL ARTICLES

#### *Maternal thyroid and glucocorticoid hormone interactions in larval fish development, and their applications in aquaculture*

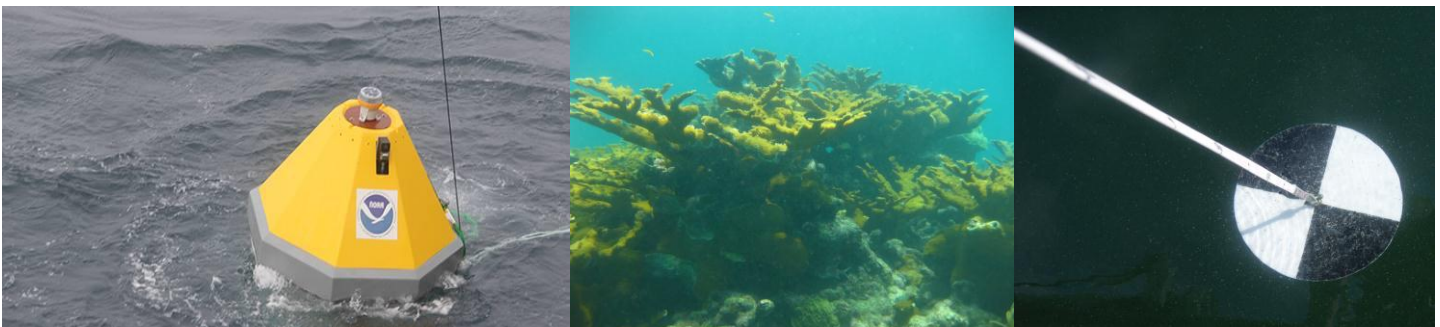
Reviews in Fisheries Science

**C.L. Brown (NMFS/NEFSC), E. Urbinati, W. Zhang, S.B. Brown, and M. McComb-Kobza**

- Treatments with exogenous thyroid and corticoid hormones consistently promote development and reduce mortality rates in larval fishes, with potential hatchery-scale applications in aquaculture.
- Thyroid hormones (THs) have long been known to have regulatory roles in the differentiation and maturation of vertebrate embryos.
- This work provides a basis for improved efficiency of a marine fish hatchery.

Thyroid hormones (THs) have long been known to have regulatory roles in the differentiation and maturation of vertebrate embryos, beginning with the knowledge that hormones of maternal origin are essential for human fetal central nervous and respiratory system development.

Precise measurements of circulating THs led to insights into their critically important actions throughout vertebrate growth and development, initially with amphibian metamorphosis and including embryogenesis in fishes. Thyroid cues for larval fish differentiation are enhanced by glucocorticoid hormones, which promote deiodinase activity and thereby increase the generation of triiodothyronine ( $T_3$ ) from the less bioactive thyroxine ( $T_4$ ). Glucocorticoids also induce the expression of thyroid hormone receptors in some vertebrates. Maternally-derived thyroid hormones and cortisol are deposited in fish egg yolk and accelerate larval organ system differentiation until larvae become capable of endogenous endocrine function. Increases in the  $T_3/T_4$  ratio during larval development may reflect the regulatory importance of maternal thyroid hormones. Experimental applications of individual hormones have produced mixed results, but treatments with combinations of thyroid and corticoid hormones consistently promote larval fish development and improve survival rates. The developmental and survival benefits of







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maternal endocrine provisioning are increased in viviparous fishes, in which maternal/larval chemical contact is prolonged.

Accepted: 22 April 2014

### *Nomads no more: early juvenile coho migrants contribute to the adult return*

#### Ecology of Freshwater Fish

**T.R. Bennett, P. Roni, K.P. Denton (NMFS/NWFSC), M. McHenry, and R.E. Moses**

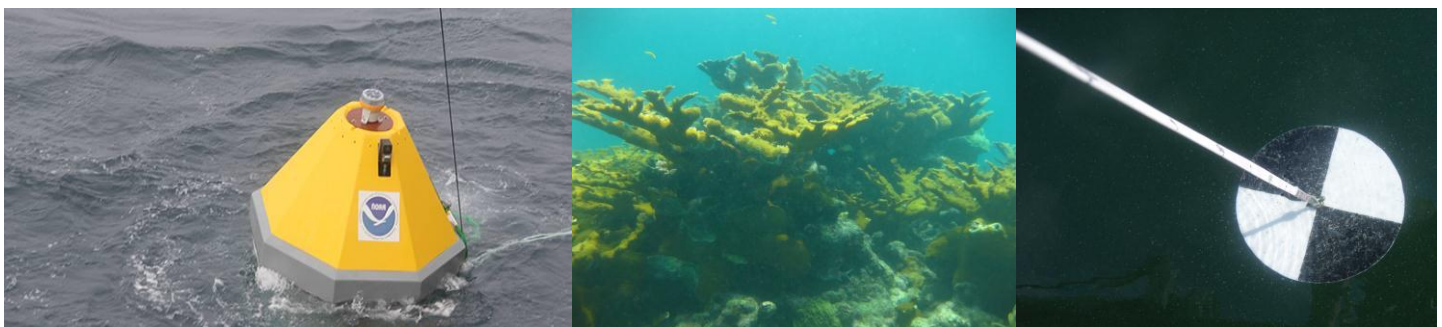
- Age-0 coho migrants return as adults.
- Traditional overwinter survival and smolt-to-adult return calculations may be incorrect.

The downstream movement of coho salmon fry and parr in the fall, as distinct from the spring migration of smolts, has been well documented across the range of the species. In many cases these fish overwinter in freshwater but they sometimes enter marine waters. It has long been assumed that these latter fish did not survive to return as adults, and were “surplus” to the stream’s carrying capacity. From 2004 – 2010 the authors internally tagged 25,981 juvenile coho salmon with Passive Integrated Transponders (PIT) in three streams in Washington State to determine their movement, survival, and the contribution of various juvenile life histories to the adult escapement. The authors detected 86 returning adults, of which 32 originated from fall/winter migrants. Half of these fall/winter migrants spent ~1 year in the marine environment, while the other half spent ~2 years. In addition, the median return date for fall/winter migrants was 16 days later than spring migrants. The results indicated that traditional methods of spring-only smolt enumeration may underestimate juvenile survival and total smolt production, and also overestimate spring smolt to adult return. These are important considerations for coho salmon life cycle models that assume juvenile coho salmon have a fixed life history or use traditional parr to smolt and smolt to adult return rates.

Expected Publication Date: Summer 2014

Published Online: 26 April 2014

<http://onlinelibrary.wiley.com/doi/10.1111/eff.12144/pdf>





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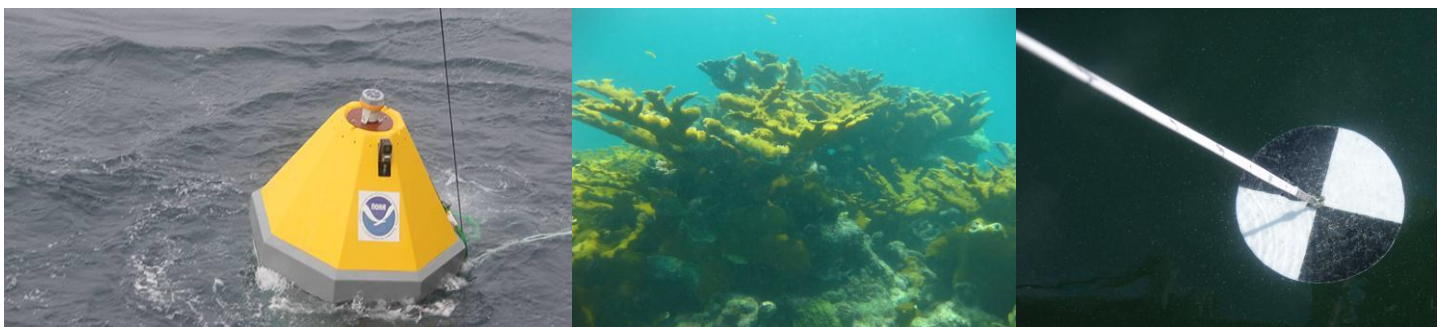
### *Statistical modeling of daily water temperature attributes on the Sacramento River*

Journal of Hydrologic Engineering

J. Caldwell, B. Rajagopalan, and **E. Danner** (NMFS/SWFSC)

- The authors develop a new model to forecast downstream water temperature in response to reservoir water releases.
- Water temperature is key factor controlling river habitat suitability for ESA listed salmon species in California's Central Valley.
- This predictive model will help dam operators balance the water needs of agricultural, municipal and industrial users with maintaining cold-water habitat for the winter-run Chinook salmon.

The Sacramento River is the largest river in California and an important source of water for agricultural, municipal and industrial users. Input to the Sacramento River comes from Shasta Lake and is controlled by operators of the Shasta Dam, who are challenged with meeting the competing needs of these users while also maintaining cold water habitat for Endangered Species Act (ESA) listed winter-run Chinook salmon. The cold water habitat goals are constrained by the volume of cold water storage in the lake, which operators attempt to selectively deploy throughout the critical late summer/fall window. Skillful forecasts of downstream water temperature attributes at the seasonal time scale are crucial to make informed decision about the release of this limited cold water resource. The authors developed a generalized linear modeling (GLM) framework with a local polynomial method for function estimation, to provide predictions of a range of daily water temperature attributes in the Sacramento River. A suite of predictors that impact water temperatures were considered for the model, including current and prior day flow, water temperature of upstream releases, air temperature, and precipitation. A two-step model selection process was applied – first an objective method based on Bayesian Information Criteria (BIC) was used in a global model to select the best set of predictors for each attribute; then the parameters of the local polynomial method for the selected set of predictors were obtained using Generalized Cross Validation





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(GCV). Daily weather ensembles from stochastic weather generators were coupled to the GLM models to provide ensembles of water temperature attributes and consequently, probability distributions and risk estimates. The authors demonstrate the utility of this approach by modeling water temperature attributes for a temperature compliance point on the Sacramento River and compare the results to an unregulated river in the Pacific Northwest.

Expected Publication Date: Unknown

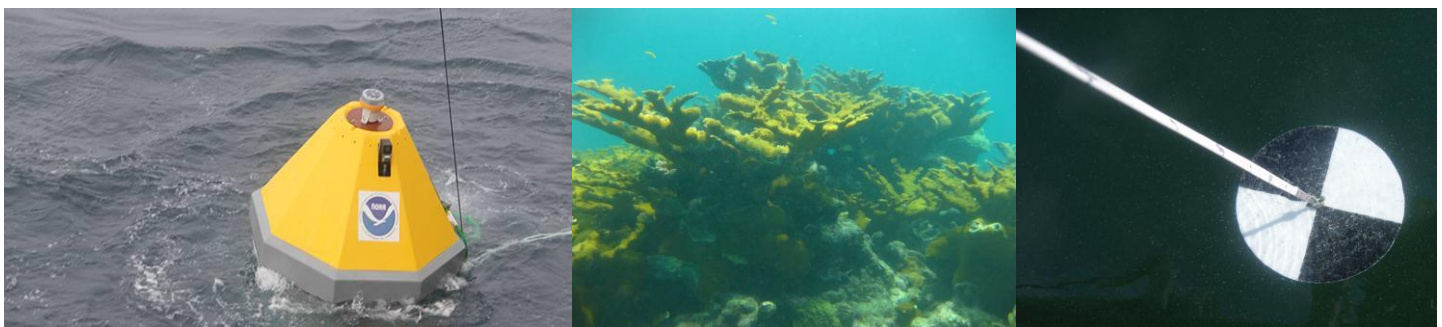
### *The Regional Snowfall Index*

Bulletin of the American Meteorological Society

**M.F. Squires, J.H. Lawrimore, R.R. Heim Jr.,** D.A. Robinson, M.R. Gerbush, and T.W. Estilow (NESDIS/NCDC)

- A new index, the Regional Snowfall Index (RSI), is a regional index that compliments the Northeast Snowfall Impact Scale (a national index for storms that affect the Northeast) and the Local Winter Storm Scale (a local station-specific index).
- The RSI was used to measure the societal impacts of ~580 snowstorms occurring between 1900 and 2013 into a century-scale historical perspective for the eastern United States.
- The RSI fills the need for a regional snowstorm index, and can be applied among a diverse cross-section of users, including both the public and private sectors, as well as researchers investigating trends and variability of winter storms.

This paper describes a new snowfall index that quantifies the impact of snowstorms within six climate regions in the U.S. The Regional Snowfall Index (RSI) is based on the spatial extent of snowfall accumulation, the amount of snowfall, and the juxtaposition of these elements with population. Including population information provides a measure of the societal susceptibility for each region. The RSI is an evolution of the Northeast Snowfall Impact Scale (NESIS) which NOAA's National Climatic Data Center began producing operationally in 2006. While NESIS was developed for storms that had a major impact in the Northeast, it includes all







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snowfall during the lifetime of a storm across the U.S., and as such can be thought of as a quasi-national index that is calibrated to Northeast snowstorms. By contrast, the RSI is a regional index calibrated to specific regions using only the snow that falls within that region. This paper describes the methodology used to compute the RSI, which requires region-specific parameters and thresholds, and its application within six climate regions in the eastern two-thirds of the nation. The process used to select the region-specific parameters and thresholds is explained. The new index has been calculated for over 580 snowstorms that occurred between 1900 and 2013 providing a century-scale historical perspective for these snowstorms. The RSI is computed for Category 1 or greater storms in near real-time; usually a day after the storm has ended.

Expected Publication Date: May 2014 (online) and November 2014 (print)

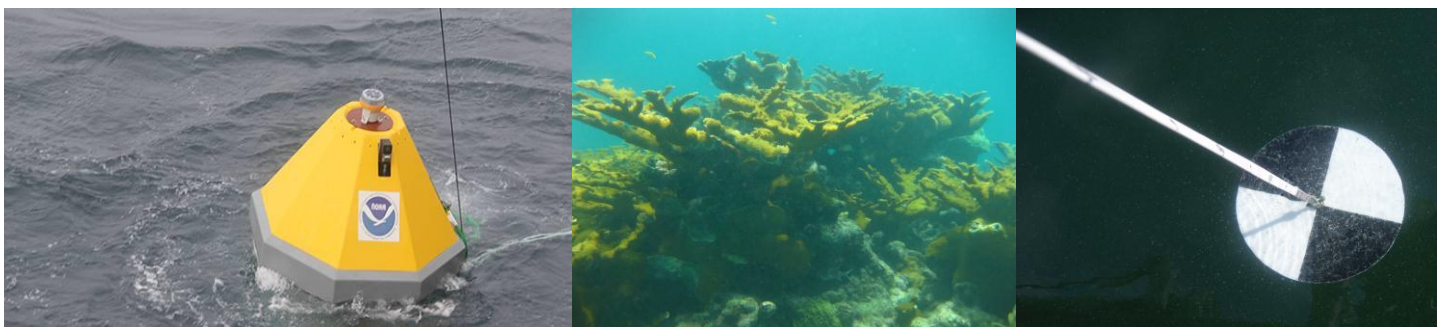
*How does the Amur River discharge flow over the northwestern continental shelf in the Sea of Okhotsk?*

Progress in Oceanography

**A. Fujisaki, H. Mitsudera, J. Wang, and M. Wakatsuchi (OAR/GLERL)**

- The authors identified two routes (the western and eastern routes) that could transport Amur River water more than 100 km offshore over the northwestern continental shelf.
- Model results show that unique effects in the Sea of Okhotsk allow the Amur River discharge to be effectively transported over the northwestern continental shelf.
- Unlike a general river discharge that flows along the coast, this river discharge deposits materials into the pathway of the dense shelf water.

The paths of the Amur River discharge on the continental shelf in the Sea of Okhotsk are still unknown despite their significance in transporting dissolved and particulate iron. In this study, we conduct a coupled ice-ocean simulation for the northern Sea of Okhotsk from June 1998 to September 2000 to answer a the question: Can Does the Amur River discharge deposit materials to the pathway of the dense shelf water? In a series of numerical experiments, we identified two







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routes (the western and eastern routes) that could transport the river water more than 100 km offshore over the northwestern continental shelf. The two routes share the clockwise gyre in the Sakhalin Gulf and the northeastward flow on the northwestern continental shelf. These features are connected through the westward jet along the slope from the Sakhalin Gulf (the western route), and the northward transport over the shelf break canyon (the eastern route). The river water, the dense shelf water, and the easterly wind are in a fine geophysical balance for those features, and all are required for the formation of the two routes. The model results show that these unique joint effects in the Sea of Okhotsk that allow the Amur River discharge to be effectively transported over the northwestern continental shelf, unlike a general river discharge that flows along the coast, and can deposits materials into the pathway of the dense shelf water.

Accepted: 23 April 2014

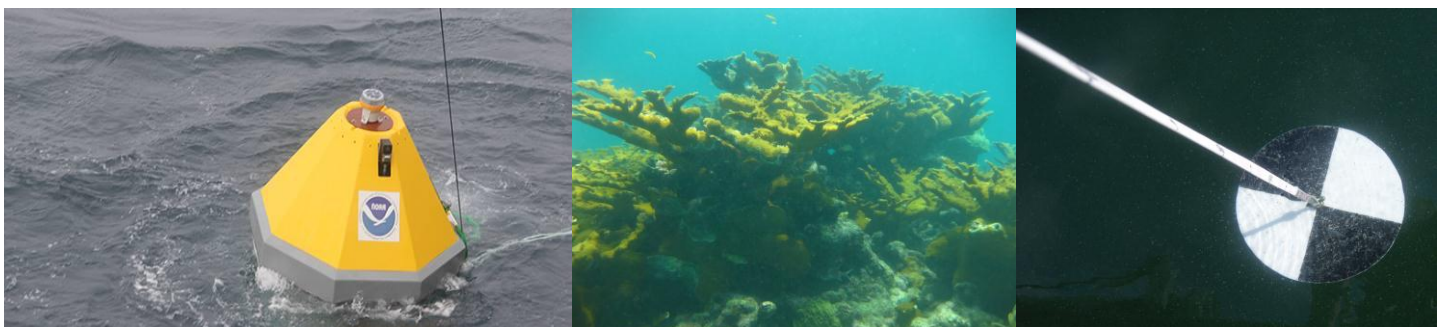
*Investigating spatial variation and temperature effects on maturity of female winter flounder (*Pseudopleuronectes americanus*) using generalized additive model*

Canadian Journal of Fisheries and Aquatic Sciences

M.V. Winton, **M.J. Wuenschel**, and **R.S. McBride** (NMFS/NEFSC)

- There may be greater variation in maturity size and age within stock components than between stock components for winter flounder.
- The approach described associates maturity patterns with different regions, focusing on temperature as a habitat.
- The results are consistent with current recognition of stock structure for this species.

Generalized additive models were used to investigate fine-scale spatial variation in female maturity across the three United States' winter flounder (*Pseudopleuronectes americanus*) stocks, as well as the effect of temperature on maturity. Maturity models explicitly incorporating spatial structure performed better than “traditional” methods incorporating spatial effects by aggregating data according to predefined stock boundaries. Models including temperature explained more of the variability in maturity than those based only on fish size or





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age but did not improve fit over models incorporating spatial structure. Based on the size- and age-at-maturity estimates from the spatially explicit models, distinct subareas were objectively identified using a spatially constrained clustering algorithm. The results suggested greater variation in size- and age-at-maturity within than between existing stock areas. The approach outlined here provides a method for identifying areas with different vital rates without the need to presume subjective boundaries.

Accepted: 21 April 2014

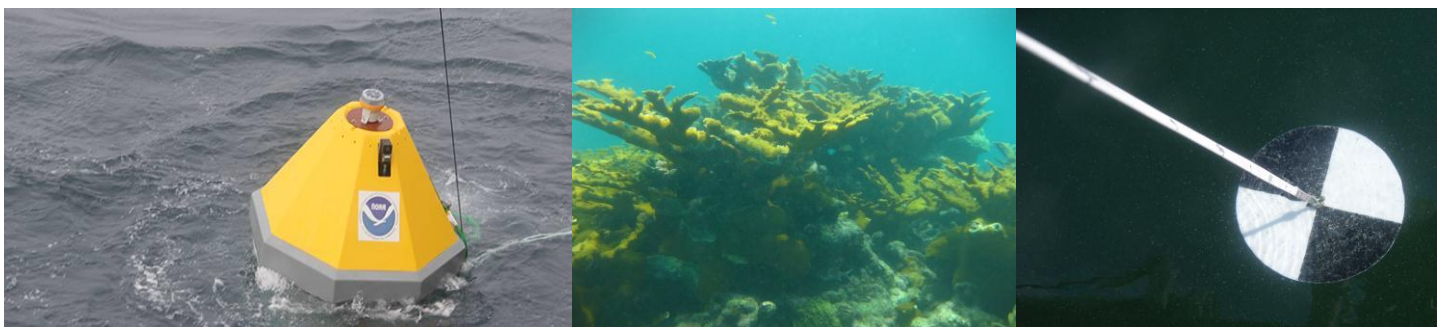
*Connecting international priorities with human wellbeing in low-income regions: lessons from hawksbill turtle conservation in El Salvador*

Local Environment

M.J. Liles, M.J. Peterson, Y.S. Lincoln, **J.A. Seminoff** (NMFS/SWFSC), A.R. Gaos, and T.R. Peterson

- The primary importance of highly endangered hawksbill sea turtles in El Salvador is the economic value attached to egg sales, but there exists a deeper connection to local culture.
- Egg purchase by hatcheries is a socially just conservation strategy that benefits both hawksbill and human wellbeing. Opportunities for local residents to participate in decision-making regarding sea turtle conservation are limited, and should be increased.
- Authors believe harmonising international conservation priorities with local community development realities is one path towards simultaneously contributing to long-term sea turtle recovery and human wellbeing in low-income regions.

Hawksbill turtles (*Eretmochelys imbricata*) are highly endangered in the eastern Pacific Ocean, yet their eggs continue to be an important subsistence resource for impoverished coastal residents in El Salvador. In this study, authors use naturalistic inquiry to explain the realities experienced by coastal residents who share habitat with hawksbills in El Salvador, and then suggest implications of the disparities between these realities and international priorities for





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hawksbill conservation and community development in El Salvador and other low-income regions. To provide a context for understanding hawksbill conservation and its implications for similar challenges related to conservation and wellbeing, authors first summarize the conservation context, including the emergence of sea turtle conservation in El Salvador. They then describe our naturalistic approach, including the ethnographic methodology for this study. Finally, they detail the analysis of interviews conducted with tortugueros (i.e. local sea turtle egg collectors), to help explain how hawksbills fit into local realities. Their results demonstrate that, from the perspective of tortugueros, (1) the primary importance of hawksbills is the economic value attached to egg sales, but there exists a deeper connection to local culture; (2) egg purchase by hatcheries is a socially just conservation strategy that benefits both hawksbill and human wellbeing; and (3) opportunities for local residents to participate in decision-making regarding sea turtle conservation are limited, and should be increased. Authors argue that harmonising international conservation priorities with local community development realities is one path towards simultaneously contributing to long-term sea turtle recovery and human wellbeing in low-income regions.

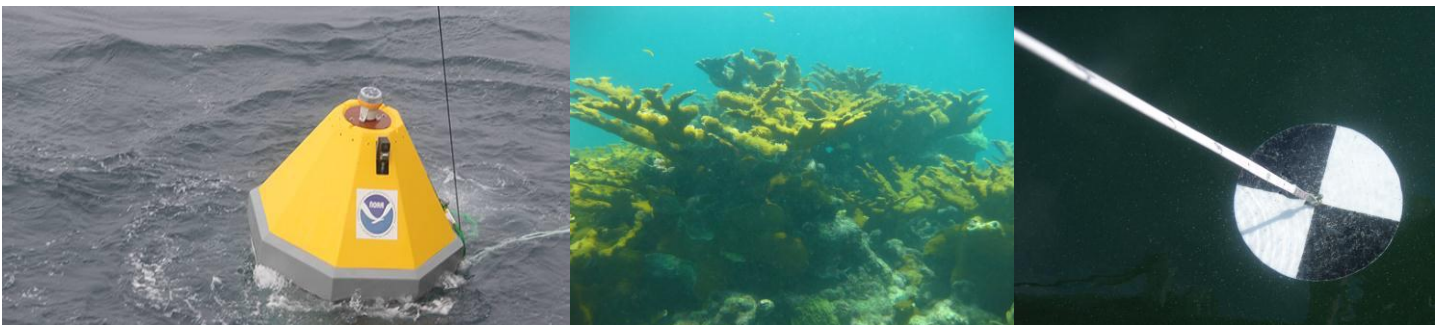
Expected Publication Date: Summer 2014

*A new look at methane and non-methane hydrocarbon emissions from oil and natural gas operations in the Colorado Denver-Julesburg Basin*

Journal of Geophysical Research - Atmospheres

**G. Petron, A. Karion, C. Sweeney, B. R. Miller, S. A. Montzka, G. Frost, M. Trainer, P. Tans, A. Andrews, J. Kofler, D. Helmig, D. Guenther, E. Dlugokencky, P. Lang, T. Newberger, S. Wolter, B. Hall, P. Novelli, I. Brewer, S. Conley, M. Hardesty, R. Banta, A. White, D. Noone, D. Wolfe, and R. Schnell (OAR/ESRL)**

- The authors present measurements of hydrocarbons in the atmosphere near a region of very active oil and natural gas development in Colorado.







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- The author's findings suggest that emissions of hydrocarbons from the energy-development activities are higher than what is estimated in the state's inventory.

Expected Publication Date: May 2014

#### *Sensitivity of sediment paleolimnological proxy records to coring locations and corer types in a large lake*

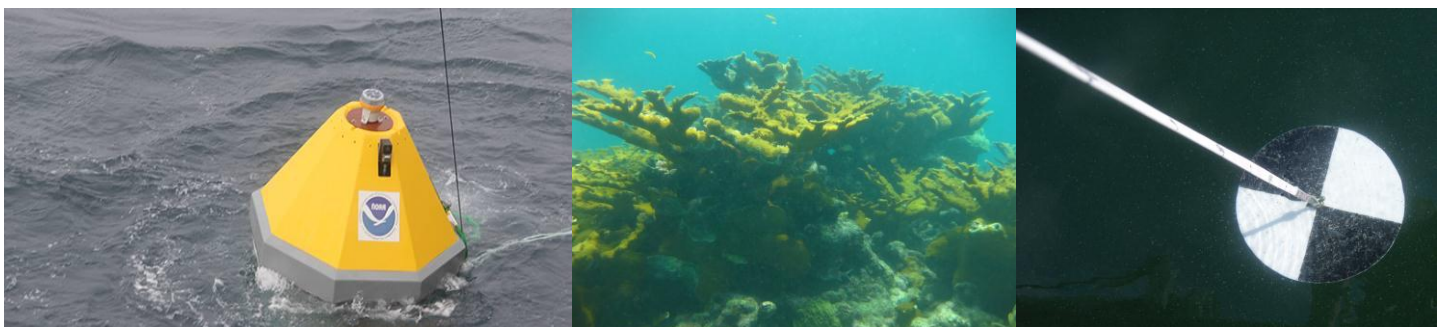
Geochemistry, Geophysics, and Geosystems

Y. Lu, P. Meyers, **J. Robbins**, **B. Eadie**, and **N. Hawley (OAR/GLERL)**

- Paleolimnological proxies from five coves collected in Lake Erie show that the proxies are sensitive to both small changes in position and to how they were collected.
- This makes high resolution reconstruction unreliable.

We compared a suite of paleolimnological proxies in sediment cores collected in 1982, 1988, 1991, and 2001 from sites near the depocenter of Lake Erie to evaluate the reliability of paleoenvironmental reconstructions derived from lacustrine sediments. Our proxies included the mass accumulation rates and carbon isotopic compositions of organic inorganic carbon. The variance of most proxies was influenced not only by temporal environmental changes, but also by sampling location differences and sediment variability due to the use of different corers. Despite the high sedimentation rates in Lake Erie, paleolimnological reconstructions at temporal resolutions comparable to sedimentation rates were not consistent for all the proxies. This inconsistency may be related to the limited dating resolution of these sediment cores due to episodic storm sedimentation and variable bioturbation. Together these results indicate that paleolimnological reconstructions are sensitive to local depositional dynamics, corer type, and the sediment dating resolution.

Expected Publication Date: Summer 2014







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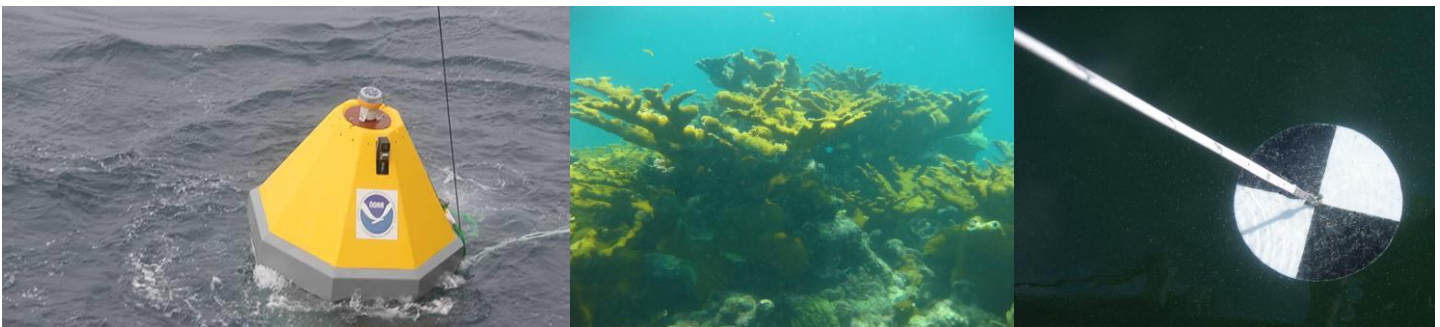
*Time course of oocyte development in winter flounder (Pleuronectidae: Pseudopleuronectes americanus) and spawning seasonality for the Gulf of Maine, Georges Bank, and Southern New England stocks*

Journal of Fish Biology

Y.K. Press, **R.S. McBride**, and **M.J. Wuenschel** (NMFS/NEFSC)

- This paper investigates egg development (oogenesis) in female winter flounder, a traditional groundfish species, using samples primarily from a cooperative study fleet operating in the north east U.S. EEZ (funded by the Northeast Cooperative Research Program).
- The study achieves a greater resolution of data, which demonstrates advanced evaluation of flounder maturity during sea-going sampling, and improves modeling of the effects of maturity dynamics used to estimate spawning stock biomass.
- The authors also report on spatial effects, such that spawning occurs later in the Gulf of Maine, and how others may use these data to look at winter flounder spawning over different spatial or temporal scales.

Winter flounder *Pseudopleuronectes americanus* were collected at monthly intervals, December 2009 - May 2011, to describe the pattern and seasonality of oocyte development, including: 1) the group-synchronous transition from primary to secondary oocytes that initiates immediately after spawning; 2) the slow (months) development of vitellogenic oocytes followed by the rapid (weeks) maturation of oocytes; 3) the synchronous nature of mature oocytes ovulating but the discrete releases of benthic eggs in batches; 4) the protracted (months) degradation of postovulatory follicles; and 5) the occurrence of follicular atresia. Although fish were collected across only ~2° latitudinal range, the spawning season was about 1 month later in the Gulf of Maine than on Georges Bank and in southern New England. This is likely due to lower temperatures in the Gulf of Maine. These stock-specific data regarding the time course of oogenesis are of practical value. We discuss, in particular, how this information can aid in measuring and interpreting elements of reproductive potential such as maturation, skipped





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spawning, and fecundity; the response of reproductive traits by this widely distributed species to changing climate; and the response by this common, marine-estuarine species to urbanization, particularly environmental pollutants and dredging.

Accepted: 28 April 2014

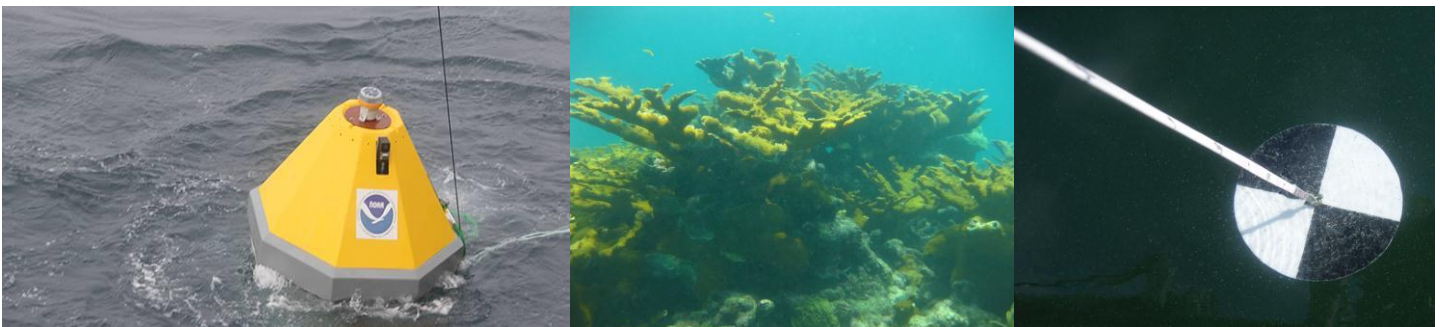
### *Effects of fishing on the fishes and environment of coral reefs*

Book: Ecology of Reef Fishes, edited by C. Mora, University of Hawaii Press

**E.E. DeMartini (NMFS/PIFSC/FRMD)**

- In this book chapter it is suggested that the definition of “overfishing” in coral reef ecosystems be extended to encompass detrimental local ecosystem impacts incurred by the depletion of species like herbivores that play key ecological roles.
- Research is greatly needed to identify the spatial and temporal scales at which reef ecosystems operate so that the scales at which they should be managed can be adequately defined.
- Research should focus on quantifying the extent to which harvest of extraction-sensitive, ecologically important species might be decremented below levels of maximum sustainable yield.

The effects of fishing on coral reef fishes include both direct and indirect effects. Some of the former are obvious, such as reductions in overall abundance and body size by increasing overall population mortality. Additional obvious but indirect effects include impacts on reef habitat resulting from destructive fishing practices such as blast fishing. Other indirect effects are those most important to the maintenance of healthy reefs—effects on ecosystem functioning that result from disruption of the natural size and assemblage structure of reef fishes. Some evidence exists for reefal trophic cascades but the examples are most compelling when strongly interacting species are present in the system. Evidence for tri- and multi-trophic cascades is complex and more data are needed to elucidate interactions among trophic levels, especially those involving apex predators. Most artisanal reef fisheries are unselective and multispecies,





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span the trophic spectrum, and include keystone predators and competitors and functionally dominant habitat engineers. Large-bodied fishes are disproportionately reduced by targeting and general overharvesting. The largest-bodied species and individuals within species, though, contribute disproportionately to population and community dynamics, and some like parrotfishes and other large herbivores further contribute disproportionately as habitat engineers to ecosystem functioning by bio-eroding reefs and controlling coral-algal dynamics. Progress in reducing fishing effects on ecosystem functioning will require careful balance between social safeguards and resource management that effectively applies new developments in conventional fishery science that either complement (or are complemented by) effective no-take MPAs. Expected Publication Date: late 2014

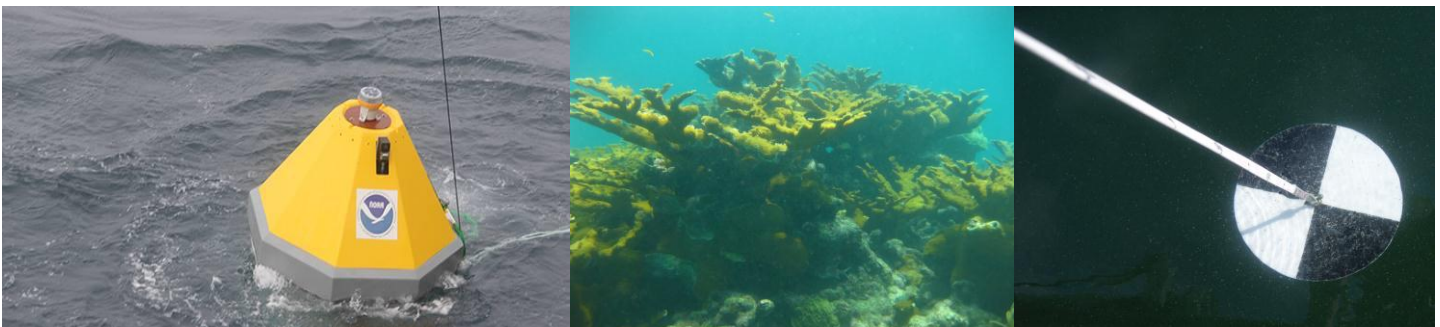
### *Effects of chemical contaminants on growth, age-structure, and reproduction of *Mytilus edulis* Complex from Puget Sound, Washington*

Bulletin of Environmental Contamination and Toxicology

**A.N. Kagley, R.G. Snider, and E. Casillas (NMFS/NWFSC)**

- Assessment of age-weight and length-weight relationships, age structure, and reproductive status of the blue mussel in Puget Sound, WA.
- Results support the hypothesis that mussels from urban areas of Puget Sound exhibit a lower growth rate, altered population age-structure, and potential reproductive impairment as a result of exposure to chemical contaminants.
- Results support the use of mussels as sentinel species to assess the biological effects of contaminants on invertebrate populations.

Bivalves are widely used as sentinel species to detect chemical contaminants in the marine environment, but biological effects on indigenous populations that result from chemical exposure are largely unknown. The Authors assessed age-weight and length-weight relationships, age structure, and reproductive status of the blue mussel from various sites in Puget Sound, WA. Mussels from areas with sediment containing elevated concentrations of







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PAHs and PCBs exhibited high tissue burdens of these contaminants. Age-weight relationships showed that the growth rate was lower in these mussels. The Authors also documented reduced fecundity in these populations. Results of this study support the hypothesis that mussels from urban areas of Puget Sound exhibit a lower growth rate, altered population age-structure, and potential reproductive impairment as a result of exposure to chemical contaminants. These findings support the use of mussels as sentinel species to assess the biological effects of contaminants on invertebrate populations.

Expected Publication Date: Summer 2014

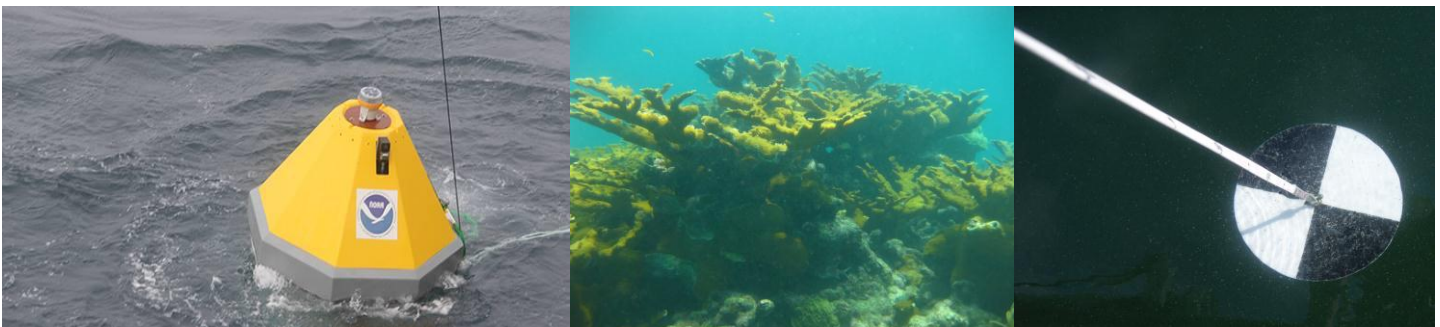
*The contribution of estuary-resident life histories to the return of adult coho salmon  
Oncorhynchus kisutch in Salmon River (Oregon)*

Journal of Fish Biology

K.K. Jones, T.J. Cornwell, **D.L. Bottom** (NMFS/NWFSC), and L.A. Campbell

- Juvenile coho salmon rear in the Salmon River estuary for weeks or months.
- Extensive restoration of estuary wetlands has expanded life history diversity in the Salmon River coho population and may strengthen population resilience.
- Juveniles with estuary-associated life histories account for as much as one third of the adults now produced in the Salmon River basin.

Extensive tidal-wetland restoration in the Salmon River has afforded a unique opportunity to evaluate the estuary's role in the life-history diversity of a small coastal population of coho salmon *Oncorhynchus kisutch*. Restoration of most historic wetland habitat in the Salmon River estuary since 1978 has reestablished connectivity between freshwater and estuarine environments, expanding habitat opportunities for juvenile rearing and life history expression. Studies initiated in 2008 have quantified adult and juvenile abundances in the Salmon River basin and determined estuarine habitat use, life history composition, growth, and survival for four successive broods of coho salmon. Subyearling and yearling coho salmon used restored and natural estuarine wetlands, particularly in the spring and winter. Stream-reared yearling







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smolts spent an average of two weeks in the estuary growing rapidly before entering the ocean. Emergent fry also entered the estuary in the spring, and some resided in a tidal marsh throughout the summer, even as salinities increased to greater than 20. A significant portion of the summer stream-resident population of juvenile coho migrated out of the watershed in the fall and winter, and used estuary wetlands and adjacent streams as alternative winter rearing habitats until the spring when they entered the ocean as yearling smolts. PIT tag returns and juvenile life history reconstructions from otoliths of returning adults revealed that four juvenile life history types contributed to the adult population. Estuarine-associated life-history strategies accounted for 20-35% of the adults returning to spawn in the four brood years, indicating a sizable proportion of the total coho salmon production is ignored by conventional estimates based on stream-habitat capacity. Juvenile coho responses to the reconnection of previously unavailable estuarine habitats has led to greater life history diversity in the population and reflects greater phenotypic plasticity of the species in the Pacific Northwest than previously recognized.

Expected Publication Date: April 2014 (early view)

